

Harris CapRock Communications, Inc.

Call Sign: E030253

File No.: SES-MOD-20140606-00440

Earth Station: General Dynamics SATCOM (formerly VertexRSI) Model 6.3m Cassegrain Antenna

Compliance with FCC Report & Order (FCC 96-377) for the 13.75 - 14.0 GHz Band

Pursuant to FCC Report and Order 96-377 (“FCC 96-377”), the 13.75-14.0 GHz band is allocated to the fixed satellite service (“FSS”) on a co-primary basis with U.S. government shipboard radar radiolocation operations and National Aeronautics and Space Administration (“NASA”) Tracking and Data Relay Satellite Systems (“TDRSS”) operations. As demonstrated in this exhibit, Harris CapRock Communications, Inc.’s (“Harris CapRock”) 6.3m gateway earth station (the “Vertex 6.3m”) in Houston, Texas complies with FCC 96-377 and will operate in the 13.75-14.0 GHz band within the parameters designed to protect U.S. Navy radiolocation and NASA TDRSS operations and will not cause harmful interference. The parameters for the earth station are:

Table 1. Earth Station Characteristics

- Coordinates (NAD-83): 29°35’ 54.0” N, 95°20’50.0” W
- Satellite Location: Telstar 14R (formerly Estrela do Sul 2) at 63° W.L.
- Frequency Band: 13.75-14.5 GHz for uplink
- Polarizations: Horizontal/Vertical
- Emissions: 18M0G7W & 9M00G7W
- Modulation: Digital
- Maximum Uplink EIRP: 18M0G7W: 65.4 dBW / 9M00G7W: 62.4 dBW
- Transmit Antenna Characteristics:
 - Antenna Size: 6.3m
 - Antenna Type/Model: General Dynamic SATCOM (formerly VertexRSI) 6.3m Cassegrain Antenna
 - Gain: 57.3 dBi @ 13.875 GHz

18M0G7W

- RF power into Antenna Flange: 8.1 dBW or -28.4 dBW/4 kHz.

- Minimum Elevation Angle: Houston, Texas (40.7° @ 128.0° Azimuth) at 63° W.L. (Telstar 14R).
- Side Lobe Antenna Gain: $32 - 25 \cdot \log(\theta) = -8.2$ dBi for $\theta = 40.7^\circ$

9M00G7W

- RF power into Antenna Flange: 5.1 dBW or -28.4 dBW/4 kHz.
- Minimum Elevation Angle: Houston, Texas (40.7° @ 128.0° Azimuth) at 63° W.L. (Telstar 14R).
- Side Lobe Antenna Gain: $32 - 25 \cdot \log(\theta) = -8.2$ dBi for $\theta = 40.7^\circ$

Because the 13.75-14.0 GHz band is shared with the U.S. government, coordination in this band requires resolution data pertaining to potential interference between the subject earth station and U.S. Navy radiolocation and NASA TDRSS services.

1. Potential Impact to Government Radiolocation (Shipboard Radar)

U.S. Navy shipboard radiolocation operations may occur anywhere in the 13.4-14.0 GHz frequency band. FCC Order 96-377 allocates the top 250 MHz of this 600 MHz band to FSS on a co-primary basis with radiolocation operations and provides that FSS earth stations must have a power flux density (“PFD”) value of -167 dB(W/m²/4 kHz) to prevent harmful interference to government radiolocation services. The closest distance to the shoreline from the Houston, Texas earth station is approximately 34 km west toward Trinity Bay. The calculation of the power spectral density at this distance is given by:

- Clear Sky EIRP: 65.4 dBW for 18M0G7W; 62.4 for 9M00G7W
- Carrier Bandwidth: 18 MHz for 18M0G7W; 9 MHz for 9M00G7W
- PD at antenna input: -28.4 dBW/4kHz for 18M0G7W and 9M007GW.
- Transmit Antenna Gain: 57.3 dBi @ 13.875 GHz
- Antenna Gain Horizon: FCC Reference Pattern
- Antenna Elevation Angle: 40.7°

The earth station will radiate interference toward the ocean according to its off-axis side-lobe performance. A conservative analysis, using the FCC standard reference pattern, results in off-axis antenna gains of -8.2 dBi towards Trinity Bay.

- The signal density at the shoreline, through free space is:
 - PFD = Antenna Feed Power density (dBW/4kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBW-m²)

$$\begin{aligned}
 \text{PFD} &= -28.4 \text{ dBW/4kHz} + (-8.2) \text{ dBi} - 10 \cdot \log[4\pi \cdot (34000\text{m})^2] \\
 &= -138.2 \text{ dBW/m}^2/4 \text{ kHz} - \text{Additional Path Losses (61.1 dB)} \\
 &= -199.3 \text{ dB(W/m}^2/4 \text{ kHz)}
 \end{aligned}$$

Our calculations indicate additional path loss of approximately 61.1 dB including absorption loss and earth diffraction loss from the earth station to the nearest shoreline. The calculated PFD for both emission designators, including additional path losses to the closest shoreline, is -199.3 dB(W/m²/4 kHz). This is 32.3 dB below the -167.0 d(BW/m²/4 kHz) interference criteria of the R&O 96-377. Therefore, there should be no interference to the U.S. Navy radiolocation operations from the Houston, Texas earth station due to the distance and the terrain blockage between the site and the shore.

2. Potential Impact to NASA’s Tracking and Data Relay Satellite System

Pursuant to FCC 96-377, FSS earth stations proposing to operate in the 13.75-14.0 GHz band must be coordinated with TDRSS forward link-to-LEO (US337) and with TDRSS earth stations located at NASA’s White Sands Complex in New Mexico. Because the geographic location of the Harris CapRock earth station in Houston, Texas is outside of the 390 km coordination radius of the White Sands, New Mexico ground station complex. Therefore, the TDRSS space-to-earth link will not be impacted by Harris CapRock’s earth station operations in Houston, Texas.

The TDRSS space-to-space link in the 13.772 to 13.778 GHz band is assumed to be protected if an earth station produces an EIRP of less than 71 dBW/6 MHz in this band. The subject 6.3 m gateway earth station will not transmit in this band. Therefore, there will be no potential interference to the TDRSS space-to-space link.

3. Coordination Result Summary and Conclusion

The results of the analysis and calculations performed in this exhibit indicate that Harris CapRock may operate its gateway earth station at the Houston, Texas facility without causing interference to the U.S. Navy radiolocation and NASA TDRSS space-to-earth and space-to-space operations. Accordingly, Harris CapRock may operate on a co-primary basis to U.S. government services in the 13.75-14.0 GHz band.